SUNSET BEACH
North Carolina

Pre-Dredge Analysis

Jinks Creek Numerical Modeling &
Project Status
March 21, 2017




moffatt & nichol

Discussion Outline

- Project Overview
- Volume Estimate (Compatible & Non-Compatible)
- Mary's & Turtle Creek Oyster Survey
- USACE Material Placement Island (Delayed)
- Jinks Creek Numerical Modeling Analysis
  - Calibration Efforts
  - Preferred Alignment
  - Extreme Storm Conditions
  - Conceptual & Maximum Alignments
- Next Steps
- Discussion

Project Overview

Design Considerations

- Follow Deep Water Conduits Where Feasible to Reduce Dredge Quantities & Potential Impacts.
- Maintain Adequate Width for Vessel Clearance - Minimum of Twice the Expected Beam Width for # of Vessels (Where Conditions Allow).
- Allow Sufficient Design Depth for Vessel Navigation Where Available
  - -6 MLW Where Space Allows.
  - -3 ~ -5 MLW When Space Limited.
- Provide Appropriate Side Slopes to Prevent Sloughing (Typ. 3H:1V).
- Maintain Minimum Construction Clearance of 5 Ft from any Pier, Dock, Piling, or Bulkhead.
- Maintain Consistency with Previous Permits (CAMA 22-02 & 45-02)
- Anticipated Dredge Volume ~ 181,100 CY.
  - 105,200 CY for Beneficial Reuse
  - 75,900 CY for Upland Disposal

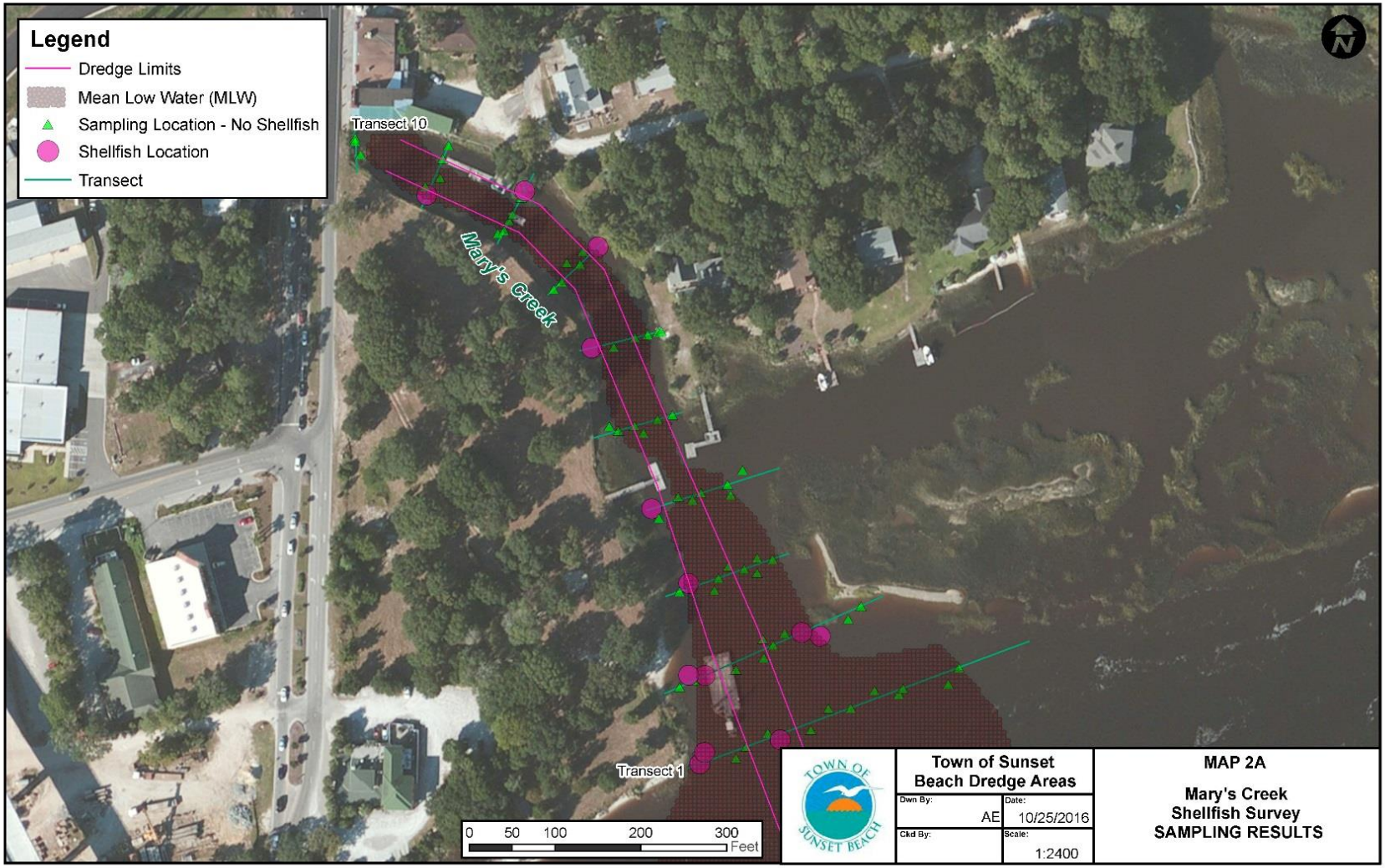
Volume Estimate

Site	Design Depth (MLW)	Length (ft)	Volume (CY)	
			Compatible	Non-Compatible
Jinks Creek*	-5 ~ -7	6,825	101,000	13,200
North Shore Drive Feeder Canal	-6 ~ -4	3,500	3,600	18,600
Finger Canals (A, B, C, & D)	- 4	3,200	0	10,700
Canal Drive** Bay Area	-6 tapering to -5	2,200	600	17,600
Mary's Creek	-5 tapering to -3	1,075	0	8,000
Turtle Creek	-5 tapering to -3	1,100	0	7,800
Total		**17,900**	**105,200 CY**	**75,900 CY**

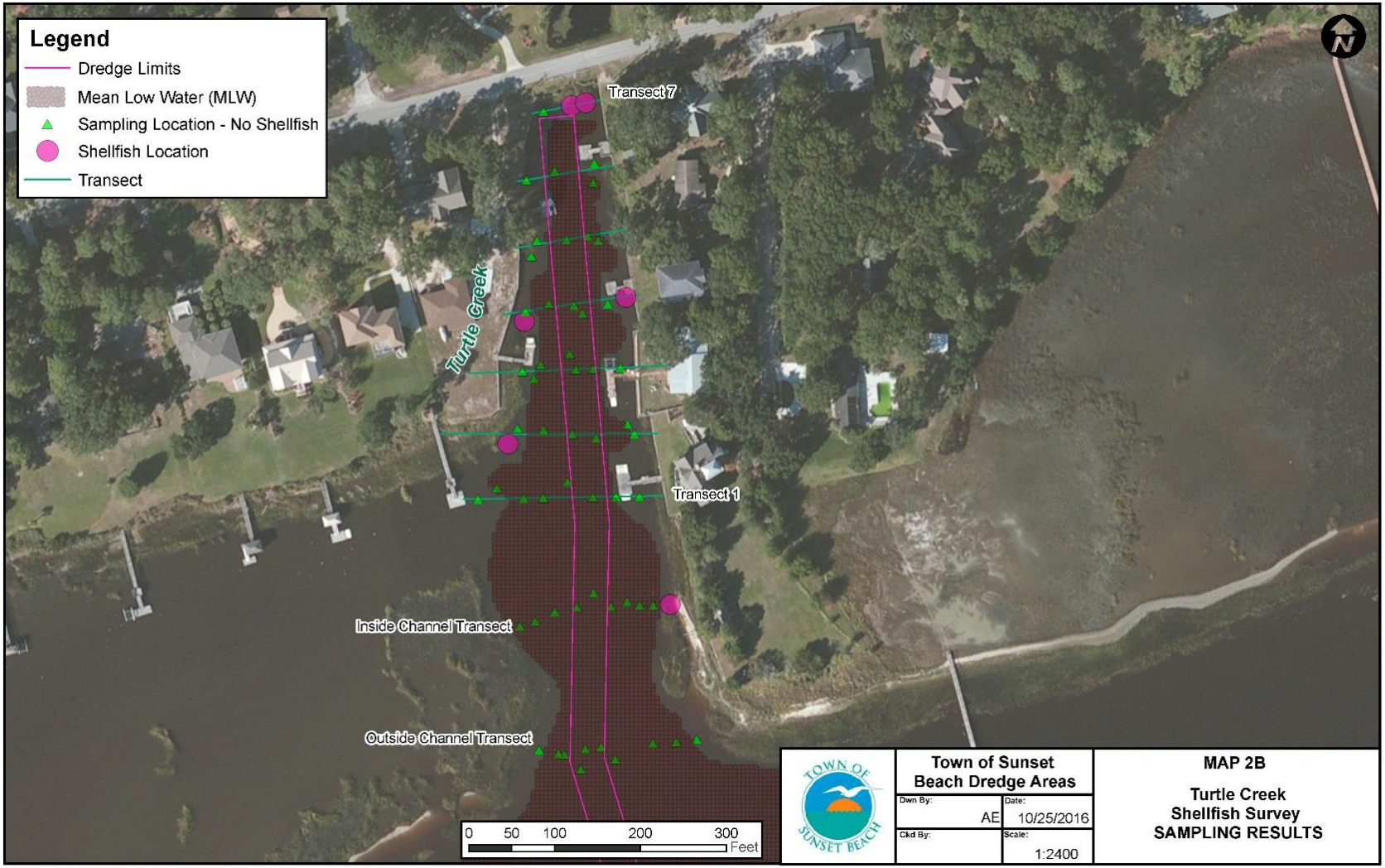
* The Jinks Creek compatible volume estimate must be confirmed with DCM.
* *The design depth for the Bay Area alignment has been raised in efforts to minimize the excavation of non-compatible material.

Volume Estimate

Shellfish Survey – Mary's Creek



Shellfish Survey – Turtle Creek



Potential USACE Material Disposal Islands

2002 Project Utilized Site 308 to Place an Estimated 80,000 CY

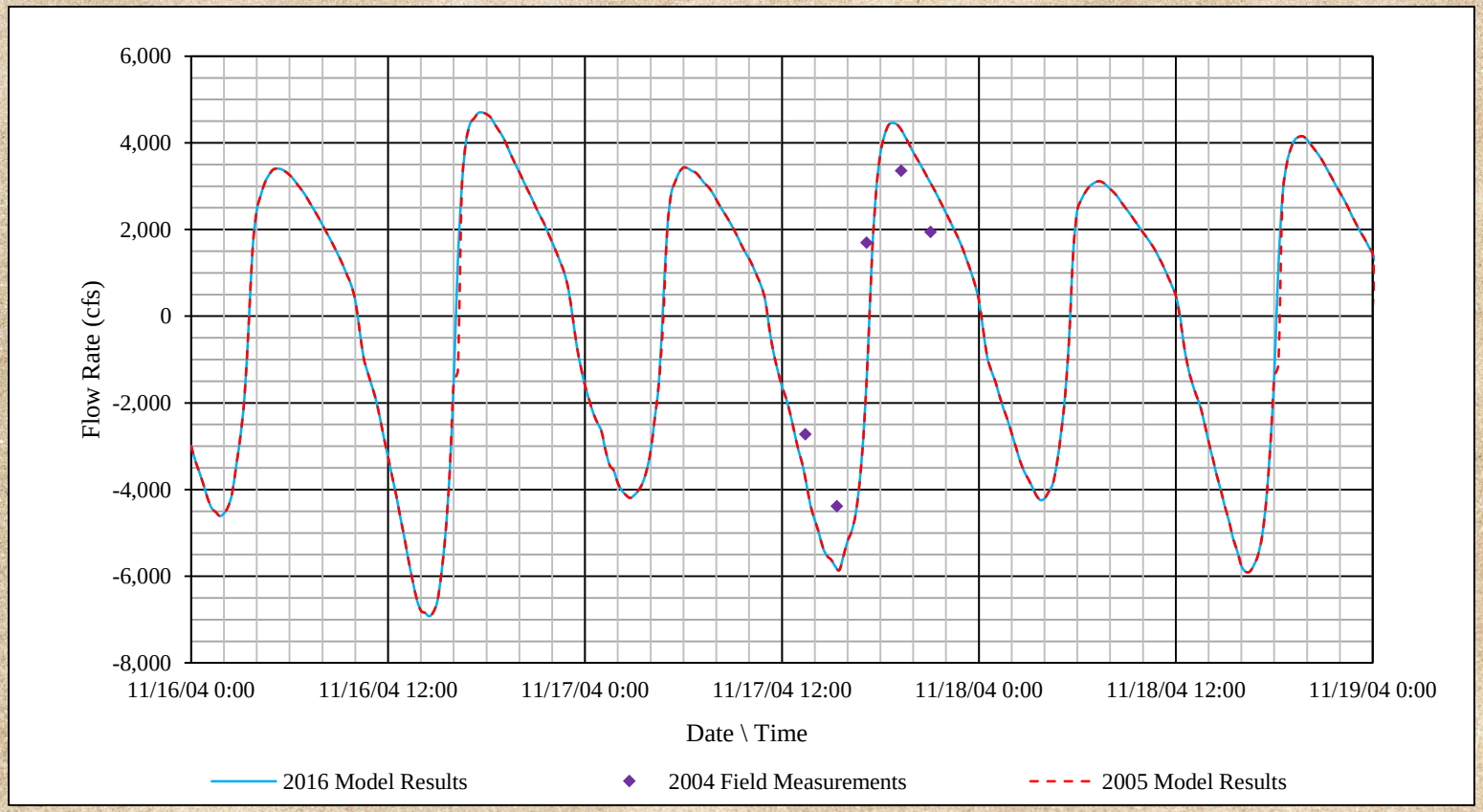
Numerical Modeling

- Builds on a Previous Study to Help Control Cost & Expedite Schedule.
- Addresses the Three (3) Concerns Expressed by DCM & USACE
  - Additional Shoaling in the AIWW Confluence with Jinks Creek;
  - Increased Scour Potential along 'S" Curve Alignment;
  - Influence on Tubbs Inlet Shoaling & Migration Patterns.
- Evaluates Extreme Storm Conditions (Hurricane Hugo).
- Considers Additional Alignments to Evaluate how the Designs may Change the Results.

Calibration Efforts

The 2016 analysis compared the flow rate results at five (5) transects approx. to the Jinks Creek study area to check if the model would produce reasonable estimates of the current tidal conditions.

Calibration Efforts



Results matched very close to 2005 analysis. Overall the model may overestimate the flow rate magnitudes; but the results are considered acceptable.

Preferred Alignment

Established 10 new transects to evaluate USACE & DCM concerns.

T1 – T3: Shoaling in AIWW Confluence.

T4 – T6: 'S' Curve Alignment.

T7 – T10: Tubbs Inlet.

Preferred Alignment – Change in Maximum Velocities (Spring Tide Conditions)

Preferred Alignment – % Change in Maximum Velocities (Spring Tide Conditions)

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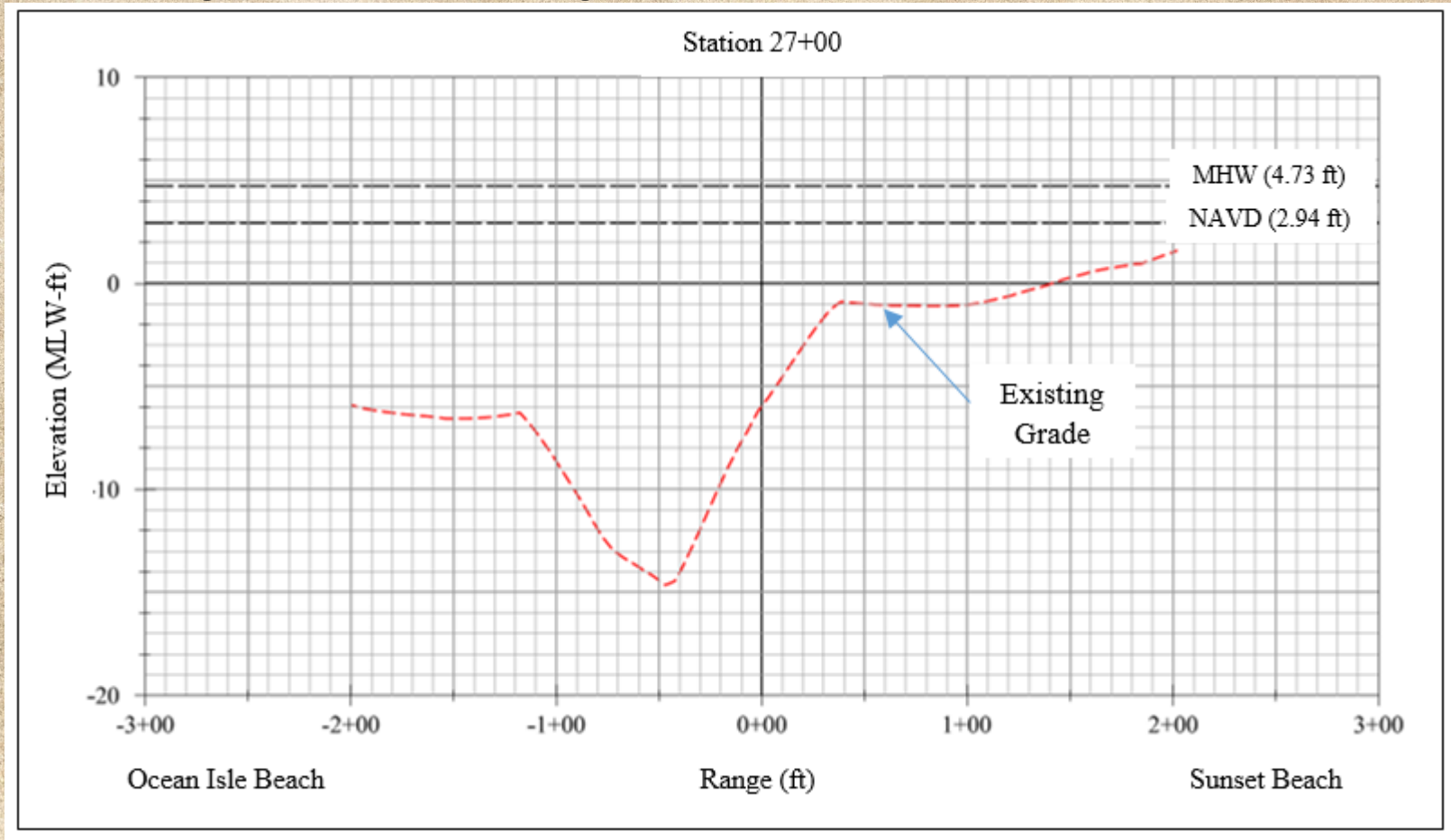
Transect		2016 Existing Conditions	Preferred Alternative	Percent (%) Change
AIWW Confluence	T1	1.53 ft/sec	1.56 ft/sec	1.6%
	T2	1.05 ft/sec	1.06 ft/sec	0.8 %
	T3	2.75 ft/sec	2.82 ft/sec	2.6%
'S' Curve Alignment	T4	3.45 ft/sec	3.46 ft/sec	0.3%
	T5	2.86 ft/sec	2.88 ft/sec	0.7%
	T6	3.01 ft/sec	3.02 ft/sec	0.3%
Tubbs Inlet	T7	2.28 ft/sec	2.30 ft/sec	0.9%
	T8	4.72 ft/sec	4.74 ft/sec	0.4%
	T9	3.69 ft/sec	3.68 ft/sec	-0.3%
	T10	2.45 ft/sec	2.44 ft/sec	-0.4%

1. Values are depth averaged velocities simulated from Nov. 13, 2004 (13:15) to Nov. 20, 2004 (13:15) tidal conditions.

Preferred Alignment – % Change in Maximum Velocities (Spring Tide Conditions)



- Scour Velocities Appear to Already Occur in 'S' Curve Alignment at Station 27+00 (Transect T5).

Preferred Alignment – % Change in Average Flow Rates (Spring Tide Conditions)

Transect		2016 Existing Conditions		Preferred Alignment		Percent (%) Change	
		Ebb	Flood	Ebb	Flood	Ebb	Flood
AIWW Confluence	T1	1,250	3,140	1,270	3,190	1.6%	1.6%
	T2	1,530	1,450	1,560	1,440	2.0%	-0.7%
	T3	1,510	2,450	1,580	2,520	4.6%	2.9%
'S' Curve Alignment	T4	2,320	2,800	2,400	2,880	3.4%	2.9%
	T5	2,600	3,230	2,680	3,300	3.1%	2.2%
	T6	3,250	4,220	3,340	4,290	2.8%	1.7%
Tubbs Inlet	T7	4,400	5,740	4,500	5,840	2.3%	1.7%
	T8	10,600	12,100	10,700	12,200	0.9%	0.8%
	T9	1,530	1,230	1,520	1,230	-0.7%	0.0%
	T10	2,350	2,180	2,350	2,170	0.0%	-0.5%

1. Values represent averaged measurements simulated from Nov. 13, 2004 (13:15) to Nov. 20, 2004 (13:15) tidal conditions.

Extreme Storm Conditions (Hurricane Hugo)

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Table 8. Jinks Creek Maximum Velocity Changes - Extreme Storm Condition (Hurricane Hugo)

Transect	2016 Existing Conditions	Preferred Alternative	Percent (%) Change
T3	2.02 ft/sec	2.07 ft/sec	2.4%
T5	3.07 ft/sec	3.11 ft/sec	1.3%
T7	3.41 ft/sec	3.45 ft/sec	1.2%

1. Values represent depth averaged measurements occurring from September 20, 1989 (10:30) to September 22, 1989 (18:29).

Table 9. Jinks Creek Average Flow Rates - Extreme Storm Condition (Hurricane Hugo)

Transect	Average Ebb Flow (Incoming) cfs		Percent (%) Change	Average Flood Flow (Outgoing) cfs		Percent (%) Change
	2016 Conditions	Preferred Alternative		2016 Conditions	Preferred Alternative	
T3	2,742	2,808	2.4%	3,721	3,793	1.9%
T5	5,162	5,267	2.0%	5,684	5,774	1.5%
T7	13,092	13,267	1.3%	12,132	12,278	1.2%

1. Values represent averaged measurements occurring from September 20, 1989 (10:30) to September 22, 1989 (18:29).

Alternate Designs

- Conceptual - 100’ Wide @ -7 MLW (entire channel)
- Maximum - 100’ Wide @ -7 MLW (entire channel & Tubbs Inlet)

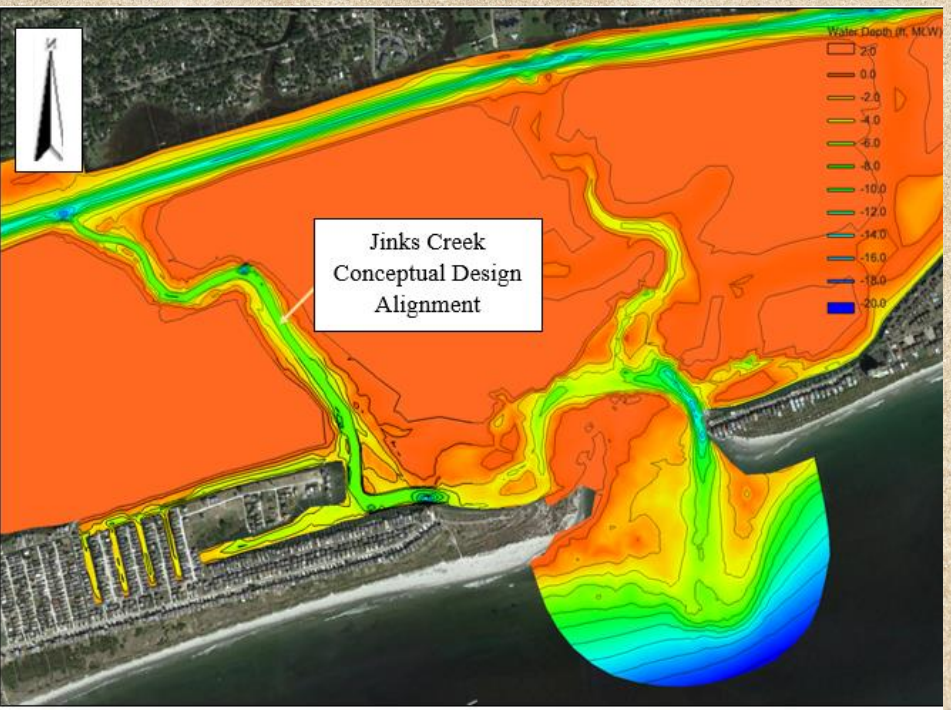

Figure 2. Bathymetry Contours for the Conceptual Design Alternative

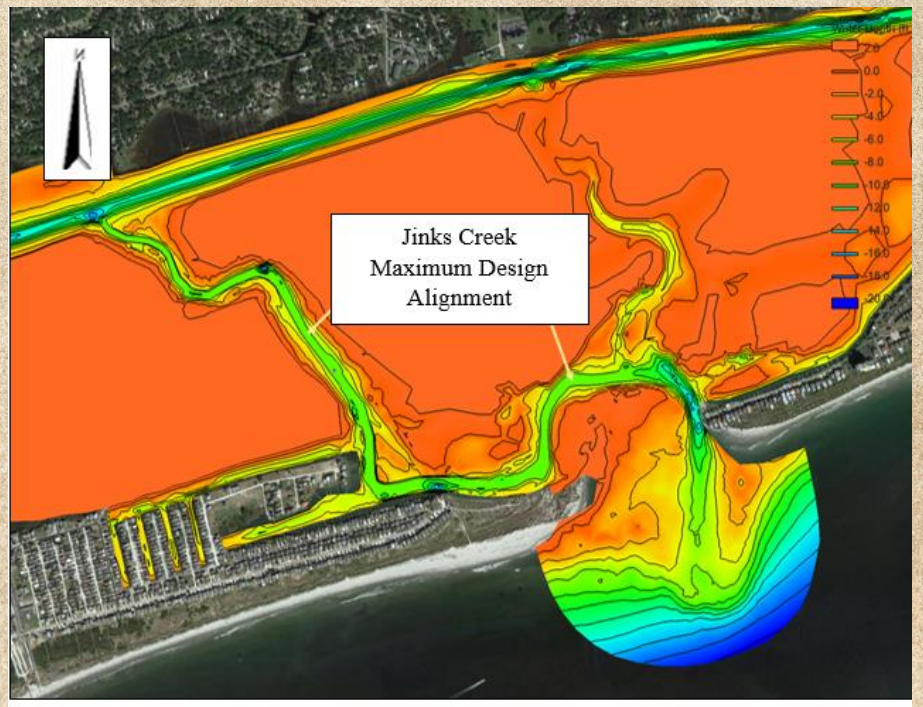

Figure 3. Bathymetry Contours for the Maximum Design Alternative

Alternate Designs – Conceptual & Maximum Alignments

- Flow Rates in Northern Jinks Creek Increase 20% to 40%, Which Suggest Significant Changes May Occur.

Alternative		Average Flood Flow (Incoming) cfs	Percent (%) Change	Average Ebb Flow (Outgoing) cfs	Percent (%) Change
Transect T3 (AIWW Confluence)	2016 Existing Conditions	2,400	-	1,400	-
	Conceptual Design	2,800	17%	1,700	21%
	Maximum Design	2,900	21%	1,900	36%
Transect T5 ('S' Curve)	2016 Existing Conditions	2,500	-	3,100	-
	Conceptual Design	2,900	16%	3,500	13%
	Maximum Design	3,000	20%	3,700	20%
Transect T7 (Tubbs Inlet)	2016 Existing Conditions	5,800	-	4,400	-
	Conceptual Design	6,100	5%	4,600	5%
	Maximum Design	6,100	5%	4,800	9%
Transect T8 (Tubbs Inlet)	2016 Existing Conditions	12,100	-	10,600	-
	Conceptual Design	12,300	2%	10,800	2%
	Maximum Design	12,600	4%	11,000	4%

1. Values represent averaged measurements occurring from November 13, 2004 (13:15) to November 20, 2004 (13:15).
2. Percent (%) change measured from the 2016 Conditions results

Modeling Summary

- Preferred Alignment Should Not Create Significant Changes to the Tidal Conditions of Jinks Creek:
    - Maximum Velocities Should Experience <5% Increase.
    - Average Flow Rates Should Experience <5% Increase.

- A Constricted or Minimized Channel Proposed for the Preferred Alignment in Northern Jinks Creek Helps to Reduce the Potential for Increased Tidal Velocities & Flow Rates.

Next Steps

- Agency Coordination Meeting – Request by April 3rd.
- Begin Discussion With Town of Ocean Isle for Material Placement, Cost Share, and Project Review.
- Provide Results of Agency Coordination Meeting to Town Council for Consideration on Moving Forward to Permitting Phase.

Thank you!

Questions and Comments